

# Highly Reliable Structural Health Monitoring of Smart Composite Vanes for Jet Engine, Phase II

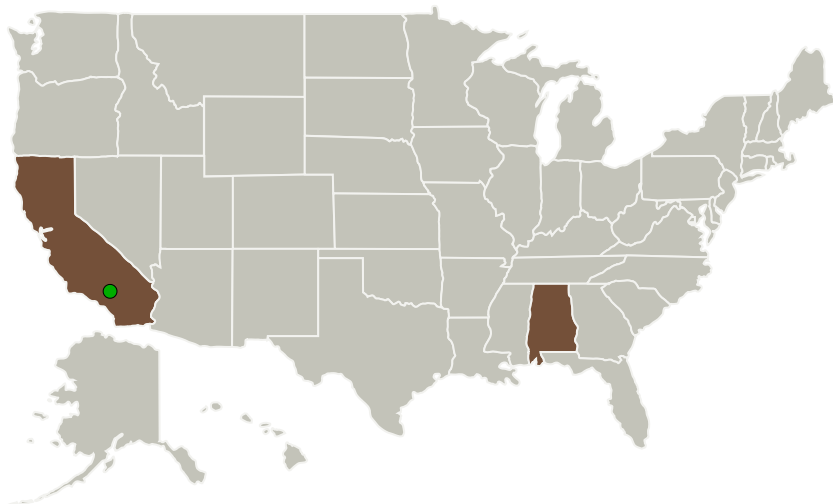
Completed Technology Project (2011 - 2014)



## Project Introduction

In Phase 1, Intelligent Fiber Optic Systems (IFOS) successfully demonstrated a Fiber Bragg Grating (FBG) based integrated Structural Health Monitoring (SHM) sensor system capable of providing in-situ crack detection, location, damage quantification and validation of structural models. The system offers advanced features to perform non-contact, non-destructive dynamic testing of composite structures. Tests were successfully carried out on composite coupons produced to mimic smart composite parts such as aircraft wings and jet engine vanes. The key innovation and achievement is an advanced system that monitors up to 48 ultra-sensitive FBG strain and temperature sensors at up to an unprecedented 1.0MHz, with damage identification, location and quantification algorithms. This represents a significant advancement in the state-of-the-art, enabling for the first time, the analysis of very high-frequency dynamic events for SHM. During Phase 2, IFOS will further develop the system and deliver a prototype complete with an instrumented wing test article to NASA for independent testing. IFOS will continue to work with its commercial partners to address applications in engine vanes and market opportunities where the technology has a significant advantage. The solution could potentially evolve into an autonomous onboard monitoring system to inspect and perform Non-Destructive Evaluation and SHM of high-value assets.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Intelligent Fiber Optic Systems Corporation	Lead Organization	Industry	Santa Clara, California
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California
Auburn University	Supporting Organization	Academia	Auburn, Alabama

## Primary U.S. Work Locations

Alabama	California
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## Project Transitions

▶ **July 2011:** Project Start

✓ **July 2014:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138954>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Intelligent Fiber Optic Systems Corporation

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

Behzad Moslehi

### Co-Investigator:

Behzad Moslehi

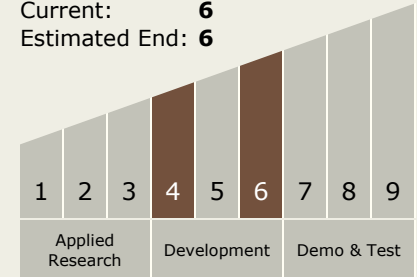
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## Technology Maturity (TRL)

Start: **4**  
Current: **6**  
Estimated End: **6**



## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.3 Mechanical Systems
    - └ TX12.3.4 Reliability, Life Assessment, and Health Monitoring

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System